Investing in Education

By Ethan Hardy

Table of Contents

"If we want to increase productivity, restore our ability to compete effectively in the global economy, and maintain and improve the standard of living for all Americans, we must substantially increase our investment in our most valuable national asset – our people."

– Senator Edward M. Kennedy, 1993.[1]

The U.S. federal government is enacting a series of legislation, beginning with the National Defense Education Act of 1958 and continuing until the present America COMPETES Act of 2007, aiming to reform and utilize the education system in order to maintain American global military and economic strength. Regarding such education reform efforts, politicians have put special emphasis on improving mathematics, science and technology education, with a special focus on students entering careers in those fields and an expectation for corresponding national economic progress.

During the cold war era, the U.S. had mainly been concerned with "national defense" and how specialization in mathematics, the physical sciences and advanced technologies could help bolster military superiority in combating "communism" and other social movements around the globe. This version of education reform and its inclination toward "national security" began a process of shifting the orientation towards U.S. "competitiveness" in global high-tech markets during the 1980s.

Although the language changed direction from the 1980s, the focus has largely remained the same. The legislation has aimed to strengthen K-12 mathematics, science and technology-related education by initiating grant programs, teacher training programs,

cooperation with private businesses and research groups, counseling programs, scholarships, supervisory services and school holidays. The Bush administration's legislation has given attention to producing visible results by requiring annual testing of students in mathematics, science, reading, energy and nuclear science education programs. Research and development funding also consists of large portions of such legislation, as the intentions are to invigorate technological and scientific innovation that impact the economy and military.

These trends allow us to raise serious questions regarding the role of education as well as the logistics of education. What are the priorities of education? Should education be designed to empower students, their families and communities or the national economy and political institutions? Before we can consider these questions, let's take a look at the history of education reform which emphasizes strengthening the market economy and nation-state.

The National Defense Education Act, 1958

U.S. Department of Education calls the National Defense Education Act (NDEA) the "first example of comprehensive Federal education legislation,"[2] which was passed by Congress and signed into law by President Dwight D. Eisenhower in 1958 following the USSR's launch of the Sputnik 1 satellite roughly one year earlier. As its title suggests, the act was intended to improve mathematics, science, engineering and foreign languages education in order to compete with the USSR and strengthen "national defense."

The stated purpose of the act was "to help develop as rapidly as possible those skills essential to the national defense."[3] A total of $470 million was used for "upgrading

instruction" on the state and federal level under Title 3 of the act. Out of that funding, $70 million in grants were sent to the States each year, 12% of which went to private institutions as loans for the purpose of purchasing new equipment for instruction in mathematics, science, engineering and foreign languages from 1959 to 1962. During the same four years, $5 million was sent to the States for improving "supervisory services" in the same subject areas.[4] The state supervisors were hired to "survey state needs, write curriculum guides and resource materials and help school districts with programs." By the end of 1960, 161 new state supervisors were hired and 118 new or proposed curriculum guides in mathematics, science and foreign language were reported.[5]

Students who intended to attain degrees in mathematics, science, engineering or foreign language could receive up to $2,500 annually for up to four years in student aid, even if they were attending school part-time. If the student agreed to teach in a K-12 school upon graduation, up to half of the loan was forgiven.[6] For the fiscal year of 1959, a total of $47.5 million was used for the student loan program. Over $75 million was authorized for NDEA student loans in the fiscal year of 1960.[7] By 1968, those funds jumped to $195 million for the fiscal year.[8]

During the fiscal year of 1960, $13.4 million was given to the states for establishing high school guidance and counseling programs to prepare students for entrance into institutions of higher education as well as establishing a system of standardized testing designed to "identify students with outstanding aptitudes and abilities" authorized under title 5.[9] Standardized testing was initiated as a mechanism for identifying students with high output and utility-value for serving cold war interests.

The subject of “national defense” was given significant priority in the act. Title 10 states that in order to receive funding through the act, students must swear an oath of allegiance to the United States as well as file an affidavit stating “that he does not believe in, and is not a member of and does not support any organization that believes in or teachers, the overthrow of the United States Government by force or violence or by any illegal or unconstitutional methods.”[10] The “loyalty oath” provision was later repealed when it was found to hinder the distribution of loans to students.[11]

The federal government estimated that “more than 800,000 additional technicians capable of working with engineers and scientists, will be needed by 1974.” Title 8 of the NDEA provided funding for “area vocational education programs” which specifically focused on training “highly skilled technicians” with expertise in “automation, computers, instrumentation, atomic energy, missiles and satellites…”[12] Education as a means to spurring innovation in military technology was a major characteristic of this legislation. The act was passed during a very tense period of the cold war and this reality is visible in much of its characteristics.

The NDEA does not represent a one-time scenario of the federal government investing significantly in mathematics, science and engineering education. In essence, the NDEA initiated a series of federal legislation directed toward improving mathematics, science and engineering fields of education with aims to strengthen the U.S. in relation to other industrialized nation-states such as the USSR during that time.

The Education for Economic Security Act, 1983

During a Senate hearing in 1983, the mean Scholastic Aptitude Test (SAT) scores in mathematics were reported to have dropped from 502 in 1963 to 466 in 1980. During the same year, high school seniors planning to specialize in education scored an average 48 points below the national average on the mathematics section of the SAT.[13] Lawmakers were certainly aware of the dropping SAT scores and viewed it as a threat to U.S. global standing, both in terms of "national security" and economic wellbeing.

The Education for Economic Security Act (EESA) of 1984 was initiated with concern for the "nation's ability to defend itself," but enhancement of U.S. high-tech business' ability to compete in the international markets was another aim of the legislation.[14] The stated purpose was to provide funding for training and retraining teachers in mathematics and science and to provide "incentives for cooperation and joint projects between educational institutions and the private sector."[15]

During 1984, for every million citizens, the USSR had 260 electrical engineers graduate from college, Japan had 163 graduates while the U.S. only had 67 graduates. In 1981, there were 70 engineers for every 10,000 people in the U.S. while Japan had almost 6 times more engineers.[16] Japan's turnout in engineers seemed to correspond to their 70% market share of 64k RAM memory chips and large shares of other high-tech import products.[17] During the same year in the U.S., 43 out of 45 of the states responding to a survey reported a shortage of math instructors.[18]

Lawmakers believed the lack of engineers correlated to the lack of mathematics instructors in public schools and decided to authorize the use of $750 million during fiscal years 1984 and 1985 for teacher training and retraining programs in mathematics

and science education under title 2 of the EESA.[19] The act also provided financial aid for students planning to teach mathematics, science or engineering by authorizing the National Science Foundation to award scholarships providing $5,000 for each year of 4 years of school.[20]

The EESA was one of the first pieces of legislation to invite big business into schools' doors. Title 3 authorized $90 million in 1984 and 1985 for forming partnerships between education institutions and the "private sector" to work on "special projects" including "improvement of instruction in mathematics, science, computer science, and engineering, for awarding scholarships to students at institutions of higher education in these fields…" The "improvement of instruction" efforts were directed towards research in the same fields and "faculty exchange programs" with private business.[21] Section 305(b)(2) of the act gave authorization for "personnel of local business concerns to serve as consultants, lecturers, teaching assistants, or teachers of mathematics, science, or computer science in the elementary or secondary schools within the state."[22]

The EESA also included a controversial amendment introduced by Senator Orrin Hatch which prohibited the use of federal funds for "any course of instruction the substance of which is secular humanism."[23]

Although "investing" in mathematics and science education as a means to strengthen military and economic innovation has been a bipartisan effort, the EESA represented a stronger concern for economic competitiveness and innovation, lacking serious attempts to create more opportunities for low-income schools.

The American Defense Education Act, et cetera of the 1980s

The Education for Economic Security Act wasn't the only piece of legislation proposed for investing more public funds in the mathematics, science, computer science and engineering fields of public education during the 1980s. A rival version of the EESA, the American Defense Education Act (ADEA) was introduced to the Senate in 1982 by Senator Gary Hart of the Democrat Party who ran against Ronald Reagan for President in 1984.

The National Education Association, an education advocacy group, published a 1983 policy paper in support of the ADEA, declaring that the public education system must be improved in order to "make the transition from an economy dominated by industry to one focused on information and services."[24] Although the National Education Association's main purpose is to "advocate for education professionals" and "fulfill the promise of public education,"[25] their support for the ADEA was seemingly based on a perceived need for public education to work as an economic utility.

The ADEA was aimed to create a national program for improving instruction in mathematics, science, technology, communication skills, and foreign languages, as well as improving guidance and counseling programs in K-12 education. The legislation would have also authorized the use of public funds as grants for improving mathematics and science education in institutions of higher education, and for establishment of education research programs in mathematics, science and foreign languages. The ADEA would have also established a stronger relationship between public education and the Department of Defense by calling on the Secretary of Defense to "project the education

needs" of the Department of Defense and the armed forces through the national program.[26]

During the early 1980s, there is quite a list of "mathematics, science, and technology training legislation," aside from the ADEA, that was proposed in the 97th Congress: National Science and Technology Revitalization Act (HR6656), National Technical Engineering and Scientific Manpower Education Act (S2421), Precollege Mathematics and Science Education Act (HR6774, S2738), National Science and Technology Improvement Act (HR6930, S2809), National Education and Economic Development Act (HR7135) and the Science and Mathematics Teacher Development Act (HR7100, S2909).[27]

Although neither the ADEA nor any of the above listed legislation was signed into law, their introduction to the Congress floors testifies to the large amount of bipartisan support for the use of public education to achieve global economic and military innovation. The lack of conflict between the two major political parties is a significant characteristic of the "national defense" and "economic security" education reform politics.

Goals 2000, 1994

"The 'competitiveness' agenda was proposed as a basis for science and technology policy in the 1980s, during the Reagan and Bush administrations, and found an articulate and ardent champion in President Clinton…With the breakdown of the traditional epics – 'winning the cold war,' 'the fight against disease' – that justify spending on science and technology, the rhetoric of 'global competitiveness' is an effort to create a new narrative of heroic proportion that serves similar purposes."[28]

To give a better understanding of Slaughter and Rhoades' (1996) explanation, this and the following sections will attempt to provide a bird's eye view of the "global competitiveness" rhetoric in congressional hearings and government documents. Although global economic competitiveness was mentioned by the Eisenhower administration and in congressional hearings on the National Defense Education Act, "national security" and the cold war were dominant themes of the legislation.

When computer and other advanced technologies became major commodities in the international economy during the 1980s, the Reagan administration used "economic competition" as a leading theme of the Education for Economic Security Act, and the theme has lived on to the current Bush administration's American Competitiveness Initiative and the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act. Although the Clinton administration also used more humanitarian "clean-up-the-schools" values in Goals 2000, the legislation was still vibrantly laden with competitiveness rhetoric.

"In short, too many of our schools are unable to prepare their students for the challenges of our society," said Senator Edward Kennedy (D-MA) in his opening statement for a Senate hearing on Goals 2000, legislation aimed at improving quality of U.S. education. "Unless we halt the slide, America's competitive position in the world and our standard of living will continue to decline."[29]

The Clinton administration, Department of Education and Congress saw a need to adapt U.S. education in accordance with "the need to improve the economic productivity of the United States to meet the competitive challenges of a new, international economy…"[30] Technological innovation of the 1980s and early 90s had introduced new

materials, products and ideas to global markets and the U.S. government correspondingly gave high priority to creating a workforce well trained in mathematics, science and engineering in order to maintain U.S. strength in the changing global economy.

When Secretary of Education Richard W. Riley spoke at a Senate hearing on Goals 2000, he first mentioned high technology, "international marketplaces" and competition which he said bring challenges to education. Senator Barbara A. Mikulski claimed that 25% of available jobs in 1993 "don't require a high school diploma." Since all of those jobs will disappear by year 2000, U.S. students need to be prepared to compete for high-tech jobs, Mikulski said.[31]

Goals 2000 included a list of educational objectives the U.S. government set to achieve by the new millennium. In 1993, President Bill Clinton introduced the legislation to Congress as an effort to aid "states, local communities, schools, business and industry, and labor in reinventing our education system so that all Americans can reach internationally competitive standards…"[32]

One objective consisted of U.S. students becoming "first in the world in mathematics and science achievement." In order to accomplish that goal, the government intended to hire or retrain 50% more teachers with "substantive backgrounds" in mathematics and science. Goals 2000 was directed toward all branches of education. In early grades, mathematics and science education, as well as studies of the metric system of measurement were hoped to be fueled with more funding and oversight. The number of graduates and undergraduates completing degrees in mathematics, science and engineering were also hoped to increase.[33]

"We need people who can use mathematics to describe pattern and to deal with probability and chance…We need it for economic reasons, we need it just so that we can carry out our full share of the burden as a free people," said Richard P. Mills, Commissioner of Education, at a hearing before the Committee on Labor and Human Resources.[34]

The act also included provisions to check the efficiency of improvement of the legislation itself. Title 5 of the act created the National Skills Standards Board to assess whether the "skills standards" are being fulfilled by public education on the state level. A number of education "skills standards" were established as a level of capability in different skills that students were expected to reach before high school graduation. The skills standards provision also appears to have more than purely educational goals behind it. Part of those standards included skills "that will result in increased productivity, economic growth, and American economic competitiveness."[35]

"Now, somehow, we have got to get industry involved in telling the schools, 'this is what we need,' so that these students can become better as adult citizens," said George H. Kaye, Vice President of Human Resources at Brigham and Women's Hospital, who the Senate consulted on the needs of the education during a hearing on Goals 2000.[36]

Goals 2000 didn't only focus on mathematics, science and engineering education, but made efforts to create safer, drug-free school environments, strengthen student competency in English, foreign languages, arts, history and geography, improve adult literacy and raise the high school graduation rate to 90% by year 2000.[37] Although concerns for opportunity inequalities connected to race, gender, and class disparities, and a variety of directions taken to improve equity in U.S. education were featured, Goals

2000 also gave significant attention to interests relating to U.S. economic productivity and strength in global markets.

No Child Left Behind, 2001

"In an age now driven by the relentless necessity of scientific and technological advancement, the current preparation that students in the United States receive in mathematics and science is, in a word, unacceptable," said House Representative Eddie Bernice Johnson in a hearing on the No Child Left Behind (NCLB) bill. "Proficiency in mathematics and technology is necessary to prepare American students for participation in the 21st century and to guarantee that the United States' economy remains vibrant and competitive."[38]

By the second year of the new millennium, the new administration as well as Congressional committees had expressed that Goals 2000 didn't provide enough improvement in mathematics, science and engineering education in the United States. The Trends in Mathematics and Science Study indicated that mathematics and science education hadn't been improved enough to raise the U.S. out of its "middle-of-the-pack position" within international student achievement in those fields, said Nick Smith, Chairman of the House Subcommittee on Research of the Committee on Science.[39]

Efforts intended to improve U.S. science and mathematics education have failed to fulfill standards for student proficiency and failed to increase the number of postsecondary students attaining degrees and careers in mathematics, science, engineering or related fields, said Smith. According to Smith, the factors accounting for the "national failure" include lack of "challenging" curricula in textbooks, "inadequate

teacher preparation" in those fields, lack of students attending advanced courses and lack of expertise on teaching in those fields.[40]

Aiming at the issue of "inadequate teacher preparation," the NCLB authorized the National Science Foundation to use $273 million in 2001 for creating partnerships between K-12 and higher educational institutions aimed at improving teacher training programs in mathematics and science and developing "challenging" curricula for those fields. The bill intended to train and hire more mathematics and science teachers, fund more education research and provide more educational materials, as listed among the "targets for reform."[41]

The legislation called on States to develop objectives for reaching "Adequate Yearly Progress" that can be measured through annual student exams. States are required to have all students scoring at the proficient level or above by the end of the 2013-2014 school year. The "performance standards" for measuring proficiency differ from State to State. For instance, in the 8th grade mathematics assessment tests for 2001, Louisiana had only 7% while Texas had 92% of students who scored at the proficient level or higher. According to educational psychologists Eva L. Baker and Robert L. Linn, the differences among student mathematics proficiency in Louisiana and Texas may not differ as greatly as the State standards for measuring that proficiency. Such circumstances seem to manifest a challenge for the federal government to assess student capabilities on the national scale. Under the NCLB, each school's "Adequate Yearly Progress" results must be organized and reported according to race/ethnicity, English proficiency, economic status and learning disabilities. The House and Senate versions of the NCLB required States to show a 1% increase in each subgroup scoring at the proficient level each year.[42]

Such efforts to annually assess the outcomes of education reform appeared for the first time with Goals 2000, yet the No Child Left Behind Act went one step farther by using those assessments to determine whether schools receive NCLB funding. In the midst of the House and Senate Subcommittee hearings on the Education for Economic Security Act of 1983, Goals 2000 of 1993 and the NCLB, Congress representatives referred to the new education budget increases as "investment" in education. With the "Adequate Yearly Progress" reports of NCLB, the federal government adopted a business practice by tracking the investments' outcomes and cutting funding to schools and programs that fail to show output. Enactment of No Child Left Behind was "an unmistakable signal that after three and a half decades of increasing education spending, Washington is finally beginning to demand some results for our children," said House Representative John A. Boehner, referring to the requirement for schools to display annual improvement in student exams in order to receive funding under the legislation.[43]

K-12 mathematics and science programs initiated by the "private sector," scientific research groups and "professional societies" were also among the list of the NCLB's "targets for reform."[44] Chairman Smith referred to "industry leaders" who witnessed the House Subcommittee hearing as "stakeholders" in "math and science education reform."[45]

Among those present was Dr. Carl Parravano, the executive director of the Merck Institute for Science Education, established in 1993 by one of the world's largest pharmaceutical companies, Merck & Co., Inc. According to Parravano, the institute intends to train teachers, provide instruction materials, build "professional communities

across and with schools" and to create policies at the state, local and federal level that "support our vision" including the NCLB.[46]

The NCLB showed many similarities to the Education for Economic Security Act of 1983. Both of the acts focused on training and retraining teachers in mathematics and science education, utilized "partnerships" between schools and businesses for teacher training and instruction assistance and were inspired by efforts to gain U.S. economic and academic strength on the world level. The NCLB also resembles Goals 2000 by creating a system of monitoring its own outcomes among the student population. Only a few years after the NCLB was enacted, U.S. economic competitiveness became an increasingly heated political issue on the floors of the House, Senate and White House.

American Competitiveness Initiative, 2006

"Our generation hasn't had its Sputnik moment yet. I am convinced it will. It will probably come from Asia…Asia is not content making Christmas tree ornaments. They want to build commercial jets, MRI machines, they want to create software and develop new pharmaceuticals. They are planning to become the innovation and technological center of the world. They want it to move from America to Asia. And it is on its way." – Mitt W. Romney, Governor of Massachusetts, May 17, 2005.[47]

As Romney exemplifies above, politicians have been concerned about China, India, South Korea and Japan's independent economic capabilities in high tech manufacturing and heavy industry. U.S. politicians view eastern economic success and technological innovation as a threat to U.S. global economic hegemony, especially considering the use-value of information and service technology in this time period.

The proportion of students attaining Ph.D.s in science and engineering in the U.S. and Asian countries is growing increasingly out of proportion. In 2004, about 500,000 Chinese students attained degrees in engineering. About 200,000 engineers graduated from Indian universities while only 70,000 U.S. students graduated with a degree in engineering.[48] Professor R.E. Smalley of Rice University predicted that "By 2010, 90% of all Ph.D. physical scientists and engineers in the world will be Asian living in Asia."[49]

The differences in academic achievement between the U.S. and Asian countries apparently correlate to cultural and lifestyle differences as well. During a House Committee hearing on high school reform in 2005, Representative Howard P. McKeon discussed his observations during a congressional trip to China. McKeon mentioned evidence indicating that students tend to display better performance in school when parents play an active role in education. In China, most families have one child, two parents and four grandparents all making efforts to ensure "that one child getting a good education," said McKeon. McKeon noted that children as well as parents in the U.S. are less likely to favor parental involvement in children's education since children become embarrassed and parents have time constraints. "If we are going to compete with China, with India, with the future, we really have some big problems," McKeon said.[50]

The U.S. is also falling behind in K-12 student performance in mathematics with a below-average score and ranking 25 out of a total of 32 countries in a recent international student assessment.[51] The International Math and Science Study ranked U.S. 12th graders in the tenth percentile for mathematics performance, meaning that the U.S. 12th graders fall below 90% of the other 12th graders participating in the study.[52]

K-12 to postsecondary mathematics and science education demographics seemingly correspond to steady power shifts in the international economy. The U.S. "share of global high-tech exports has fallen over the last 20 years from 30% to 17%, and its trade balance in high-tech manufactured goods shifted from plus $33 billion in 1990 to minus $24 billion in 2004."[53] In 2003, Asian shares of the global market have gained 210% in dollar value. The International Monetary Fund predicts that Asian shares of the global market will increase annually by an average 8% until year 2012.[54]

Statistics indicate that shares of information and communication technologies in manufacturing generally correlate to student performance in mathematics as well as gross domestic expenditure in research and development. In the international economy, South Korea, Japan and Finland have the largest shares of information and communication technologies in manufacturing and they all lead the U.S. in research and development expenditures. In the Organization for Economic Co-operation and Development's international student assessment of mathematics performance, Finland and South Korea scored the highest with Japan falling slightly behind the Netherlands in fourth place.[55]

The U.S. is also trying to compete with countries such as China which are investing heavily in infrastructure, yet the U.S. has significant infrastructure setbacks. Some 73,784 bridges in the U.S. have been classified as "structurally deficient" by engineers who evaluated bridges with the same design as the one that recently collapsed over the Mississippi River in Minneapolis.[56]

A significant portion of students attaining degrees in technical fields at U.S. universities are reported to be foreigners who may choose to leave the U.S. and work in their own countries. About 40% of students earning Ph.D.s in computer science and

engineering in American universities were born in foreign countries and will be more likely to return to their home countries. Since 1995, almost one third of Silicon Valley companies were founded by people originally from China or India who are just as capable of returning to their home country, finding cheaper labor and speaking their native tongue in business affairs.[57]

Politicians have been especially worried about Chinese and Indian strength in fields of engineering and advanced technology. "We face that competitiveness, and I believe we have to invest in our education system," said Senator Patty Murray in a committee hearing. "Our people will be our ability to compete in a global economy, and I think it is absolutely critical that we face this."[58]

Some politicians, such as Mitt Romney, tend to express their ideas in a rather apocalyptic manner. "…our national security, our economic security depend on our having a workforce which is the most innovative and skilled in the world," said Romney, in response to a question about the federal government's role in education reform at a House Committee hearing. "And if we don't, we will become a Tier 2 economy, and a Tier 2 economy cannot have a Tier 1 military. Russia tried it. We called their bluff, and they folded. And we absolutely have to have the best schools, best teachers and best kids in terms of their skills and technical capabilities in the world if we want to remain the leader of the world."[59] The discussions that take place in these recent hearings testify to the extent that politicians view the education system as a utility of U.S. global economic and military hegemony. Considering the content of those discussions, current political developments seem to be based on a perceived crisis needing immediate treatment.

U.S. high schools must "adopt a much more rigorous curriculum with additional requirements for math and science" in order to deal with a new economic challenge unlike any other in the past, said John A. Boehner, Chairman of the House Committee on Education and the Workforce.[60] Creating education policies endorsing larger amounts of mathematics and science requirements has been a bipartisan initiative since the National Defense Education Act of 1958. Recently the efforts have been taken up by an executive branch project announced by George W. Bush in his State of the Union speech in February 2006: "My 2007 Budget recognizes the importance of innovation to our economic future – fostering and encouraging all the components that make our economic engine the envy of the world."[61]

The American Competitiveness Initiative (ACI) initiated a list of education and research and development federal budget increases beginning in 2007, aimed at "maintaining our competitive edge" in global markets and student performance "through the bolstering of our world-class R&D enterprise and through investments in our education and information infrastructure…" [62] Bush refers to education as an "infrastructure" in which the government makes "investments," revealing the overwhelming business-like focus on outcome and results in the policy planning.

ACI policies include raising the research and development (R&D) budget more than 50% above that of 2001, up to $137 billion. Most of that funding contributed to biomedical research and advanced military technologies. To encourage private investment in R&D, the ACI includes the expansion of a R&D tax credit which rewards businesses for such investment. The initiative also intended to authorize $380 million for mathematics, science and technological education in K-12 schools, which is being used to

train 70,000 new mathematics and science teachers for Advanced Placement/International Baccalaureate courses, recruit mathematics and science professionals into adjunct teaching, create a National Math Panel for conducting research and providing suggestions for mathematics instruction, create a "Math Now" program to raise the level of mathematics proficiency among elementary and middle school students and evaluate science, technology, engineering and mathematics (STEM) education programs. The evaluation program includes assessing "the impact of government-wide investments in math and science education," instruction methods and student interest in the STEM fields. To encourage more students to major in STEM fields, the American Competitiveness Grants program provides a total of $4.5 billion in grants to students who declare their major in mathematics, science or "critical" foreign languages as well as maintain a 3.0 grade point average.[63]

Like all of its predeceasing legislation aimed at improving technical education for "national defense" and "global competitiveness," the ACI has extensive bipartisan support as well as support among science groups and private enterprise.[64] According to E. Ann Nalley, President of the American Chemical Society, the ACI "will enable the U.S. to retain its preeminent global position as a world economic leader."[65]

Although the "competitiveness" agenda puts a lot of focus technological and scientific innovation in the business word, the cold war "national defense" similarities continue to be associated with "competitiveness" education reform, represented by the Bush administrations "war on terrorism." "How does America keep its brainpower advantage, which is the way we keep our good jobs from going to China and India," said

Senator Lamar Alexander, at a subcommittee hearing in the U.S. Senate. “It is the way we win the war on terror.”[66]

The Bush administration claims the ACI is enacting many of the recommendations put forth in the National Academy of Sciences October 2005 report entitled “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future.” The report was commissioned by congress and was spearheaded by retired Lockheed Martin Chairman Norman Augustine.[67]

The ACI exemplifies the federal government’s role in lubricating the impact that large-scale market economics, the “R&D enterprise” and the political elite exert upon U.S. education.

America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act, 2007

The COMPETES Act is a synthesis of bills designed to carry out the ACI policies. “With support from both sides of the aisle, the bill will encourage students to pursue careers in science, technology, engineering and mathematics,” said Senator John Ensign of the Commerce Subcommittee on Technology, Innovation and Competitiveness.[68]

Such student encouragement is planned to begin at a young age. Section 1105 of the COMPETES Act calls on the Director of the Office of Science and Technology Policy to “encourage” all elementary and middle schools to observe a “Science, Technology, Engineering, and Mathematics Day” two times each school year in order to “excite and inspire students to pursue the science, technology, engineering, and

mathematics fields (including continuing education and career paths)." The act also asks the director to "promote" the involvement of the "private sector," institutions of higher education and science and professional mathematics and engineering organizations in a "Science, Technology, Engineering, and Mathematics Day."[69]

Much of the act's new policies, such as the classroom holiday, are designed to lure students into pursuing careers in the STEM fields. Another section of the act authorizes a total of $20 million during fiscal year 2008 for grants going to institutions of higher education with programs producing graduates in nuclear science and institutions which agree to create such programs. Institutions which receive those grants must use the money to enhance nuclear science programs and increase the number of students attaining degrees in such programs. Another $20 million in grants for 2008 was authorized for "specialty secondary schools" that provide advanced mathematics, science, engineering and technology education. The "national energy education development" section of the act aims to improve instruction relating to "science," "sources" and "uses" of energy in U.S. society in grades K-9 science classes. The act will also establish mentoring programs for women and minorities who want to pursue careers in science, engineering and mathematics.[70]

The "Math Now" program for elementary and middle schools and the advanced placement/international baccalaureate programs, first announced as part of the American Competitiveness Initiative, were enacted by the COMPETES Act. Similar to NCLB, all of the new programs, including the grant programs, require that states periodically assess the programs' results and report those assessments to the Director of the Office of Science and Technology Policy.[71]

Although the American Competitiveness Initiative includes extending the R&D tax credit, the COMPETES Act did not enact such a policy. The COMPETES Act didn't authorize the adjunct teacher program aiming to recruit 30,000 new teachers from the business world and professional organizations. The White House expressed concern about the legislation creating "30 new programs" fulfilling tasks which could be "more appropriately left to the private sector…"[72]

Aside from education policies, much of the act is directed toward research and development (R&D) investment and "encouragement." The Innovation Acceleration Research Program, Standards and Technology Acceleration Research Program and the Experimental Program to Stimulate Competitive Technology were established to provide grants, "cooperative agreements" or contracts with public or private organizations (including educational institutions and businesses) for research and development.[73]

With its overwhelming focus on global competitiveness in the realms of science, technology and economics, the COMPETES Act represents one of two trends in congress pushing for education reform. The "competitiveness" trend puts emphasis on helping the privileged, "high-achieving math and science students" by "investing" in advanced curricula and developing STEM specialization among instructors, whereas the "equity" trend puts high priority on narrowing the achievement gap and providing more resources for schools in low income areas. Goals 2000 and No Child Left Behind represent both trends, yet the National Defense Education Act, Education for Economic Security Act and the COMPETES Act are dominated by economic and "national defense" interests. These two tendencies in education reform have not admitted rivalry or conflict and usually attract undeniable bipartisan support in congress. However, the "competitiveness"

camp, which the COMPETES Act represents, receives much more support from business leaders, special interest groups, middle class communities, "engineering interests" and professional mathematics and science organizations.

> "Rather than trying to change the way schools serve overlooked students, the pursuit of competitiveness focuses on improving the quality of advanced instruction for a subset of high-achieving students. Rather than demanding that teachers do a better job of boosting performance among the hard-to-educate, the competitiveness agenda calls for giving more resources and training to teachers who instruct students who are already highly successful. A competitiveness strategy focuses on augmenting the status quo rather than remaking it, and this is an easier task – substantively and politically – for legislators, governors, superintendents, and school boards."[74]

Public Opinion on the Current Trends

If we were to assess whether the public has more support for the "competitiveness" agenda or the "equity" agenda, public opinion surveys tend to show that people generally show more concerns for helping low-performing students rather than catering to the needs of students with high academic achievement, although some of the opinions held by "competitiveness" policymakers are also shared by the public in most surveys.

In the 2007 Phi Delta Kappa/Gallup poll, 61 percent of those surveyed said public schools are doing an "excellent" or "good" job of meeting the needs of "high-achieving students."[75] The 2006 Hart/Winston poll shows that 50 percent of respondents believe that public high schools are "challenging and pushing the best students to make the most of their abilities," yet 55 percent believe public high schools are "coming up short or falling behind" in teaching basic mathematics, science and writing skills. 73 percent of

respondents also believe that public schools are "coming up short or falling behind" in "supporting struggling students and preventing dropouts."[76] Although such poll results don't show whether the public supports the "equity" camp's call for action, the results show that the public generally believes that schools already cater to academic achievers while "coming up short or falling behind" in teaching basics skills and helping students with low-performance. However, the 2006 Hart/Winston poll also shows that 77 percent of respondents favor increasing funding to low-income schools "to improve their infrastructure and materials and to recruit and retain the most-gifted teachers, even if this entails shifting funds from middle- and high-income areas," which clearly represents overwhelming public support for the "equity" trend in education reform.

In the 2006 Winston Group poll, 70 percents of respondents consider general mathematics and science skills to be "very important" to all college graduates during this century, yet only 31 percent believe that mathematics and science classes are "very relevant" to students not attaining degrees in those fields. However, 54 percent believe that all students should be required to take more mathematics and science classes, "regardless of personal interest in the subject matter." Those surveyed were evenly split by 48 percent on "whether colleges and universities are currently requiring enough math and science."[77] The poll results tend to be slightly contradictory. Obviously, some respondents may believe that students should be required to take courses that are not "very relevant" to their needs and students in K-12 schools should be required to take mathematics and science courses, whereas there should be no such requirement for post-secondary students. The best hypothesis we are able to make at this point would be that the public is close to or evenly split on the issue of requiring more mathematics and

science classes in educational institutions. In the 2007 Phi Delta Kappa/Gallup poll as well, those surveyed were split evenly on whether public high schools are giving enough emphasis on teaching mathematics and science.

Although assessing public support or opposition for more mathematics and science requirements is a difficult task, the subjects of foreign language and international studies is a much easier assessment. In the 2007 Phi Delta Kappa/Gallup poll, 57 percent of those surveyed believe that students should increase the amount of time they spend studying other nations and cultures in the world, 85 percent believe it is very or somewhat important to learn a second language and 70 percent believe second languages should be taught beginning in elementary school. These poll results show that the "competitiveness" agenda is more determined to serving the interests of half the public, whereas if international studies and foreign languages were given a higher priority, the agenda would be serving the interests of a larger majority of the public. We can also contend that considerations of "high priority" school subjects differ between the federal government and the public.

In the 2006 poll by The Winston Group, 85 percent of those surveyed believe that U.S. colleges and universities have the same or better quality than those overseas and a majority believes that U.S. students are better or equally prepared for the 21st century than graduates of colleges and universities overseas. In addition, 85 percent believes that "cheaper labor is the main motivation corporations have for seeking to tap workforces overseas, compared to only 12 percent believing that more skilled labor is the primary motivation." These results show that a public majority doesn't believe the "competitiveness" agenda's efforts to create a more skilled and technically specialized

workforce will result in creating more viable U.S. economic competitiveness. Indeed, the Winston Group report shows that 62 percent of respondents believe the U.S. is near or at the top of the global economy today, but 49 percent believe that the U.S. will be near or at the top of the global economy in 20 years. The public seems to have a more favorable opinion of U.S. education in comparison to policymakers, yet the public also believes the U.S. economy will continue to lose global strength regardless of educational viability. Could we suggest that a significant proportion of the public believes the goals and efforts of the "competitiveness" camp are futile?

In the 2007 Phi Delta Kappa/Gallup poll, 49 percent of those surveyed believe local school boards should have the most influence in "deciding what is taught in the public schools," 31 percent chose state government and only 20 percent chose the federal government. Since the "competitiveness" policies are planned, written and enacted by the federal government, the poll results show us that the "competitiveness" agenda clashes with at least 49 percent of public interest which values local autonomy in choosing school curricula. 66 percent of those surveyed said they oppose "private profit-making corporations" running "entire operations" of public schools. Such results show majority opinion clashing with the "competitiveness" agenda's efforts to bring more business representatives into teacher training, faculty exchange, consulting and creating extracurricular programs.

Although much of the poll results reviewed above indicate that ACI policies conflict with public opinion, there are some results contradicting those indications. For instance, the 2006 Hart/Winston poll shows that 76 percent of those polled believe that the next generation may become worse off economically than their parents if they do not

improve skills in mathematics, science and engineering. 64 percent of respondents believe that if the education system is not reformed, "our ability to remain globally competitive will be compromised within the next decade." Such opinions correspond to those of policymakers and therefore, don't necessarily conflict with the ACI agenda.

Those three public opinion polls generally show both opposition and support for the "competitiveness" policies, although many of supportive results featured questions with denser explanations, economic political forecasts.

Conclusion

Beginning with the National Defense Education Act, i have attempted to display the history of the current "competitiveness" agenda, tracing the trend back to the first piece of educational legislation enacted by the federal government. Although the federal government has also enacted legislation directed at other aspects of the education system (high school dropouts, violence in schools, narcotics in schools, literacy, equity, low-income schools, infrastructure, etc.) including Goals 2000 and No Child Left Behind, even those have included inclinations toward the "competitiveness" drive and some of the "competitiveness" legislation also focuses on some of the aforementioned issues.

The series of education reform legislation aimed at strengthening U.S. "national defense" and "competitiveness" gives us insight to the undeniably direct relationship established between the federal and state governments, academia, the business world and the system of public and private education stretching from elementary to post-secondary institutions. Among the legislation mentioned in each section above, private business has been requested for teacher training, consulting, teacher assistance, faculty exchange,

providing scholarships, providing instruction materials, creating extracurricular programs, giving the government more information about what they expect from the education system, and recently featured in the COMPETES Act, involvement in a STEM curriculum school holiday.

Goals of education as a whole, or at least the production of skills and information, have taken a larger inclination toward economic and academic "competitiveness." Indeed, the U.S. Department of Education declares their "mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access."[78] Whether or not this is the universal goal of education, the approach to education reform which the federal government is taking seems only to account for the aspects of education that have potential utilitarian value to U.S. global power.

U.S. economic and military power may seem like an abstract concept to many students. Since much of the emphasis on STEM subjects comes from the federal government's concerns with creating a more specialized and technically capable national economy, those subjects may be difficult for students to understand. If education does not teach one about life in one's surroundings, giving a student tangible empowerment, then what is "education"?

If education is continually oriented toward skills needed in technical careers, specialization in very complex and technical subjects such as engineering, technology, science and mathematics as a means to world power, the system may risk alienating the very students that it's supposed to educate, give skills and information relating to the world in which they live.

Reference List

Introduction

[1] *Goals 2000: Educate America Act*: Hearing before the Committee on Labor and Human Resources, United States Senate, 103rd Cong., 1 (1993, May 4, 14). p 61.

National Defense Education Act, 1958

[2] U.S. Department of Education. (2007, Sept 10). "The Federal Role in Education." from www.ed.gov/about/overview/fed/role.html

[3] Barksdale Clowse, B. (1981). *Brainpower for the Cold War.* Greenwood Press. p 162.

[4] Ibid. p. 155, 163-164.

[5] Ribicoff, A.A., McMurrin, S.M. (1961). *Report on the National Defense Education Act.* U.S. Government Printing Office. p 10, 11.

[6] Ibid. p 5.

[7] Ibid. p 3.

[8] Barksdale Clowse, B. (1981). *Brainpower for the Cold War.* Greenwood Press. p 156, 162-164.

[9] Ribicoff, A.A., McMurrin, S.M. (1961). *Report on the National Defense Education Act.* U.S. Government Printing Office. p 17.

[10] Ibid.

[11] *Amending Education Act of 1958: Hearing before the Subcommittee on Education,* U.S. Senate, 86th Cong., 1 (1959, April 29 and May 5). p 1.

[12] Ribicoff, A.A., McMurrin, S.M. (1961). *Report on the National Defense Education Act.* U.S. Government Printing Office. p 39, 40.

The Education for Economic Security Act, 1983

[13] *Education for Economic Security Act: Hearing before the Committee on Labor and Human Resources,* U.S. Senate, 98th Cong., 1 (1983, June 13). p 2-3.

[14] Ibid. p 1.

[15] Ibid. p 8.

[16] Ibid. p 4.

[17] National Education Association. (1983, Feb 2). *Investing in America's Future: the Role of Public Education in Economic Growth and the American Defense Education Act.* p 5.

[18] *Education for Economic Security Act: Hearing before the Committee on Labor and Human Resources*, U.S. Senate, 98th Cong., 1 (1983, June 13). p 4.

[19] Ibid. p 8.

[20] *Education for Economic Security Act, Public law 98-377*. U.S. Congress. (1984).

[21] Ibid. p 39.

[22] Ibid. p 40.

[23] Hechinger, F.M. (1985, April 16). "About Education; Far Right Steps Up Effort To Control Classrooms." New York Times.

The American Defense Education Act and other bills of the 1980s

[24] National Education Association. (1983, Feb 2). *Investing in America's Future: the Role of Public Education in Economic Growth and the American Defense Education Act*. p 1.

[25] National Education Association. (2006). *The National Education Association Vision, Mission and Values*. Retrieved October 24, 2007, from http://www.nea.org/aboutnea/statement.html

[26] National Education Association. (1983, Feb). *American Defense Education Act: An NEA Policy Paper*. p 1.

[27] Ibid. p 34.

Goals 2000, 1994

[28] Slaughter, S. & Rhoades, G. (1996). The Emergence of a Competitiveness Research and Development Policy Coalition and the Commercialization of Academic Science and Technology. *Science, Technology and the Human Values*, 21. p 2.

[29] *Goals 2000: Educate America Act*: Hearing before the Committee on Labor and Human Resources, United States Senate, 103rd Cong., 1 (1993, May 4 and 14). p. 1.

[30] *Goals 2000: Educate America Act*. House of Representatives, 103rd Cong., 2 (1994, March 21).

[31] *Goals 2000: Educate America Act*: Hearing before the Committee on Labor and Human Resources, United States Senate, 103rd Cong., 1 (1993, May 4 and 14). p 5-6.

[32] *A draft of proposed legislation entitled, "Goals 2000: Educate America Act.* President Bill Clinton. U.S. Government Printing Office. (1993, April 22). p 1.

[33] *Goals 2000: Educate America Act*. House of Representatives, 103rd Cong., 2 (1994, March 21). p 8-9.

[34] *Goals 2000: Educate America Act*: Hearing before the Committee on Labor and Human Resources, United States Senate, 103rd Cong., 1 (1993, May 4 and 14). p 56.

[35] *Goals 2000: Educate America Act*. House of Representatives, 103rd Cong., 2 (1994, March 21). p 70.

[36] *Goals 2000: Educate America Act*: Hearing before the Committee on Labor and Human Resources, United States Senate, 103rd Cong., 1 (1993, May 4 and 14). p 54.

[37] *A draft of proposed legislation entitled, "Goals 2000: Educate America Act.* President Bill Clinton. U.S. Government Printing Office. (1993, April 22). p 4-7.

No Child Left Behind, 2001

[38] *Improving Math and Science Education So That No Child Is Left Behind*: Hearing before the Subcommittee on Research of the Committee on Science, United States House of Representatives. (2001, May 2). p 9-10.

[39] Ibid. p 2.

[40] Ibid. p 5.

[41] Ibid. p 5-6.

[42] Linn, R.L., Baker, E.L., Betebenner, D.W. (2002, August/September). Accountability Systems: Implications of Requirements of the No Child Left Behind Act of 2001. Educational Researcher, Vol. 31, No. 6, p 4, 7.

[43] House Education Committee Passes President Bush's No Child Left Behind Education Bill (H.R. 1). (2001, May 9). U.S. Newswire.

[44] *Improving Math and Science Education So That No Child Is Left Behind*: Hearing before the Subcommittee on Research of the Committee on Science, United States House of Representatives. (2001, May 2). p 5-6.

[45] Ibid. p 1.

[46] Ibid. p 53.

American Competitiveness Initiative, 2006

[47] *High School Reform: Examining State and Local Efforts*: Hearing before the Committee on Education and the Workforce, United States House of Representatives, 109th Cong., 1 (2005, May 17). p 6-7.

[48] *The Role of Education in Global Competitiveness*: Hearing before the Committee on Health, Education, Labor, and Pensions, United States Senate, 109th Cong., 2 (2006, February 9). p 2.

[49] Herbold, R.J. (2006, March). The K-12 Establishment is Putting America's Industrial Leadership at Risk. USA Today, 134, 2730. p 60.

[50] *High School Reform: Examining State and Local Efforts*: Hearing before the Committee on Education and the Workforce, United States House of Representatives, 109th Cong., 1 (2005, May 17). p 25-26.

[51] Organization for Economic Co-operation and Development. (2007). Programme for International Student Assessment.

[52] Herbold, R.J. (2006, March). The K-12 Establishment is Putting America's Industrial Leadership at Risk. USA Today, 134, 2730. p 60

[53] Oh, Woe is Us. Outlook on Science Policy. (2005, December). p 124.

[54] Full of Eastern Promise. (2007, August 25). *The Economist*.

[55] Organization for Economic Co-operation and Development. (2007). Factbook 2007: Economic, Environmental and Social Statistics.

[56] A Bridge Too Far Gone. (2007, August 11). *The Economist*.

[57] American Idiocracy. (2007, March 24). *The Economist*.

[58] *The Role of Education in Global Competitiveness*: Hearing before the Committee on Health, Education, Labor, and Pensions, United States Senate, 109th Cong., 2 (2006, February 9). p 22.

[59] *High School Reform: Examining State and Local Efforts*: Hearing before the Committee on Education and the Workforce, United States House of Representatives, 109th Cong., 1 (2005, May 17). p 28.

[60] *High School Reform: Examining State and Local Efforts*: Hearing before the Committee on Education and the Workforce, United States House of Representatives, 109th Cong., 1 (2005, May 17). p 20.

[61] Domestic Policy Council, Office of Science and Technology Policy. (2006, February). *American Competitiveness Initiative*. p 3.

[62] Ibid. p 4.

[63] Ibid. p 3, 13, 16-21.

[64] Easton, N.J. (2006, February 4). Pushing to Keep the US Competitive. *Boston Globe*.

[65] Science, Business Leaders Support American Competitiveness Initiative, Says American Chemical Society. (2006, February 6). *U.S. Newswire*.

[66] *Protecting America's Competitive Edge Act: Finding, Training, and Keeping Talented Math and Science Teachers*: Hearing before the Subcommittee on Education and Early Childhood Development of the Committee on Health, Education, Labor, and Pensions, United States Senate, 109th Cong., 2 (2006, February 28). p. 1.

[67] Easton, N.J. (2006, February 4). Pushing to Keep the US Competitive. *Boston Globe*.

America Creating Opportunities to Meaningfully Promote Excellence in Technology, Engineering, and Science (COMPETES) Act, 2007

[68] Sen. Ensign's Efforts Contribute To Passage Of Bipartisan Competitiveness Legislation. (2007, August 3). *US Fed News Service, Including US State News.*

[69] *America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (Engrossed as Agreed to or Passed by Senate).* Retrieved November 19, 2007, from **http://www.thomas.gov/cgi-bin/query/D?c110:14:./temp/~c110WH422n**

[70] Ibid.

[71] Ibid.

[72] The White House. (2007, August). *Fact Sheet: America COMPETES Act of 2007*. Retrieved November 26, 2007, from http://www.whitehouse.gov/news/releases/2007/08/20070809-6.html on 2007

[73] *America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (Engrossed as Agreed to or Passed by Senate).* Retrieved November 19, 2007, from **http://www.thomas.gov/cgi-bin/query/D?c110:14:./temp/~c110WH422n**

[74] Hess, F.M. & Rotherham, A.J. (2007, January). NCLB and the Competitiveness Agenda: Happy Collaboration or a Collision Course? *Phi Delta Kappan*, Vol. 88, Iss. 5, p. 345.

Public Opinion on the Current Trends

[75] Rose, L.C. & Gallup, A.M. (2007, September). *The 39th Annual Phi Delta Kappa/Gallup Poll Of The Public's Attitudes Toward The Public Schools.* Retrieved November 29, 2007, from http://www.pdkintl.org/kappan/kpollpdf.htm

[76] Peter D. Hart Research Associates, Inc., & The Winston Group. (2006, June 21). *Keeping Our Edge: Americans Speak On Education And Competitiveness*. Washington D.C., p. 4.

[77] The Winston Group. (2006, September). *Math And Science Education And United States Competitiveness: Does The Public Care?* p. 2, 4.

Conclusion

[78] U.S. Department of Education. (2007). *Overview*. Retrieved December 3, 2007, from http://www.ed.gov/about/landing.jhtml?src=gu